

FOURTEENTH ANNUAL REPORT  
YELLOWSTONE RIVER COMPACT COMMISSION

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YELLOWSTONE RIVER COMPACT COMMISSION

408 Federal Building  
Helena, Montana

December 15, 1965

Honorable Clifford P. Hansen  
Governor of the State of Wyoming  
Cheyenne, Wyoming

Honorable Tim M. Babcock  
Governor of the State of Montana  
Helena, Montana

Honorable William L. Guy  
Governor of the State of North Dakota  
Bismarck, North Dakota

Sirs:

Pursuant to Article III of the Yellowstone River Compact, the Commission makes the following fourteenth annual report of activities for the period ending September 30, 1965.

The fourteenth annual meeting of the Commission was held at Sheridan, Wyoming in the new Y.M.C.A. Building on November 23, 1965. Mr. F. A. Bishop, Wyoming State Engineer and Mr. Alex D. McDermott, Director of the Montana State Water Conservation Board were the designated representatives of their respective States. Mr. Frank Stermitz, designated Federal representative acted as chairman and secretary. Messrs. William Long and Thomas E. Cahill, Special Assistant Attorney General for Wyoming were also present.

During the water year ending September 30, 1965, annual streamflow at the designated points of measurement in Montana ranged from 124 to 155 percent of the 1945-60 averages. Flow was well sustained through the irrigation season. Reservoir storage at the close of the water year was substantially greater than a year ago.

No matters relating to the allocation of streamflow were noted. The State Commissioners are of the opinion that the present state of water resources development does not warrant verification or study of allocable use.

The expense of the Commission during the fiscal year ending June 30, 1965 was \$9,000.00 and a like amount is budgeted for the current fiscal year.

Respectfully submitted,

  
Floyd A. Bishop  
Commissioner for Wyoming

  
A. D. McDermott  
Commissioner for Montana

  
Frank Stermitz  
Federal Representative

## GENERAL REPORT

### Cost:

The work of the Commission, which to date has been primarily concerned with the collection of required hydrologic data, has been financed through cooperative arrangement whereby Montana and Wyoming each bear a fourth of the cost and the remaining half is borne by the United States. The salaries and necessary expense of the State representatives and hydrologic data made available by others is not evaluated or considered an expense of the Commission.

The expense of the Commission during the fiscal year ending June 30, 1965 was held to the budgeted amount of \$9,000.00 by changing of some plans because of added operating expense for gaging stations.

The budget for the fiscal year ending June 30, 1965 as arranged by correspondence at \$9,000.00 was more specifically defined at the annual meeting and is summarized:

	<u>Cost</u>
Gaging station operation and miscellaneous measurements of discharge at auxiliary points.	\$7,600
a/ Supplemental bubble gage recorder for Powder River near Locate.	400
Data assembly and secretarial functions.	<u>1,000</u>
	\$9,000

a/ Installation of bubble gage recorder purchased in previous year at another site in an effort to improve quality of discharge record.

### Gaging stations:

The collection of discharge records as specified in the Rules and Regulations or practical substitute sites was continued. It was decided to continue miscellaneous measurements of Whitehorse Canal and the Clarks Fork Yellowstone River below this diversion as discharge comparisons point to a reduction in previously indicated inflow or additional diversion. The backwater effect of the Yellowstone River in high-flow periods upon the stage-discharge relation of the Bighorn River at Big Horn was evident for a period of about 2 months. An intensive discharge measurement program rather than an auxiliary bubble gage for determination of river slope appears to be the best solution. It was agreed to use the bubble gage acquired in fiscal year 1965 at an auxiliary site on the Powder River near Locate where a more satisfactory stage record and stage-discharge relation are indicated. The measured flow from the wasteway of the Agency Canal indicates a need for continuance to supplement the data from the present gage site on the Little Bighorn River near Hardin.

Stream flow at all the designated points of measurement exceeded that of 1964 and ranged from 124 to 155 percent of the 1945-60 average. Details of streamflow and bar-graph comparisons are given in Appendix B.

#### Diversions:

Statements of two State representatives indicated that allocable diversions in Montana and Wyoming initiated since January 1, 1950 did not warrant their detailed consideration and that the use in the upstream State did not exceed Compact allowances. As recent information on new water rights has not been filed with the Commission, the State representatives were urged to do so at their early convenience. Mr. McDermott mentioned the resurvey for an up-dating of the "Water Resources Survey of Carbon County, Montana" was proceeding satisfactorily. No renewal of planning activity for the proposed Cyclone Bar diversions from the Clarks Fork Yellowstone River in Wyoming was noted.

#### Storage:

##### In reservoirs completed after Jan. 1, 1950:

Boysen Reservoir on the Wind River, operated by the Bureau of Reclamation, is the principal storage development in this category. The reservoir was virtually full on September 30, 1965, representing a gain of about 100,000 acre-feet during the water year. Anchor Reservoir on Owl Creek contained about 4,400 acre-feet as a maximum, but contained no water at the close of the year. Data for these reservoirs are given in Appendix C.

Yellowtail Dam on the Bighorn River, and now nearing completion, will create a reservoir in this category. Initial storage began early in November 1965.

The Commission is cognizant of other reservoirs in this general group and considers their aggregate effect to be insufficient to warrant the collection of storage data at this time.

##### In reservoirs existing on January 1, 1950:

Storage pertinent to Compact allocation in these reservoirs is confined to usage for new developments completed after January 1, 1950. This is currently considered to be very minor. Month-end storage data for these reservoirs is given in Appendix D as a matter of record and general information on water supply.

RULES AND REGULATIONS FOR ADMINISTRATION OF  
THE YELLOWSTONE RIVER COMPACT

A compact, known as the Yellowstone River Compact between the States of Wyoming, Montana and North Dakota, having become effective on October 30, 1951 upon approval of the Congress of the United States, which apportions the waters of certain interstate tributaries of the Yellowstone River which are available after the appropriative rights existing in the States of Wyoming and Montana on January 1, 1950 are supplied, and after appropriative rights to the use of necessary supplemental water are also supplied as specified in the Compact, the following rules and regulations are adopted subject to the provisions for amendment, revision or abrogation as provided herein.

Article I. Collection of Water Records.

- A. It shall be the joint and equal responsibility of the members of the states of Wyoming and Montana to collect, cause to be collected or otherwise furnish records of tributary stream flow at the points of measurement specified in Article V (B) of the Compact, or as near thereto as is physically or economically feasible or justified.

1. Clarks Fork

The gaging station known as Clarks Fork at Edgar, Montana and which is located in SW 1/4, sec. 24, T.4 S., R.24 E., shall temporarily be the point of measurement for the Clarks Fork, subject to whatever mutually agreeable corrections to the stream-flow records at this point as may be deemed practical to meet the terms of the Compact.

2. Bighorn River (exclusive of Little Bighorn River)

The gaging station known as the Bighorn River near Custer, Montana and located near the center of sec. 10, T.4 N., R.34 E., shall temporarily be the designated point of measurement on that stream. The flow of the Little Bighorn River as measured at the gaging station near Hardin, Montana and located in S 1/2, SE 1/4 sec. 18, T.1 S., R.34 E., shall be considered the point of measurement for that stream, except that if or when satisfactory records are not available, the records for the nearest upstream station with practical corrections for intervening inflow or diversion shall be used.

3. Tongue River

The gaging station known as the Tongue River at Miles City, Montana and located in SE 1/4, sec. 23, T.7 N., R.47 E., shall temporarily be the point of measurement for that stream.

4. Powder River

The gaging station known as the Powder River near Locate, Montana and located in NE 1/4, sec. 26, T.8 N., R.51 E., shall temporarily be the designated point of measurement for that stream.

- B. Records of total annual diversion in acre-feet above the points of measurement designated in the Compact for irrigation, municipal and industrial uses developed after January 1, 1950 shall be furnished by the members of the Commission for their respective states, at such time as the Commission deems necessary for interstate administration as provided by the terms of the Compact. Providing that if it be acceptable to the Commission, reasonable estimates thereof may be substituted.
- C. Annual records of the net change in storage in all reservoirs, not excluded under Article V (E) of the Compact, above the specified point of measurement specified in the Compact and completed after January 1, 1950, and the annual net change in reservoirs existing prior to January 1, 1950, which is used for irrigation, municipal and industrial purposes developed after January 1, 1950, shall be the primary responsibility of the member of the Commission in whose state such works are located; providing, such data is not furnished by federal agencies under the provisions of Article III (D) of the Compact, or, collected by the Commission.

Article II. Office and Officers.

- A. The office of the Commission shall be located, and be that of the United States Geological Survey in Helena, Montana.
- B. The Chairman of the Commission shall be the federal representative as provided in the Compact.
- C. The Secretary of the Commission shall be as provided for in Article III of these rules.
- D. The credentials of each member of the Commission shall be placed on file in the office of the Commission.

Article III. Secretary

- A. The Commission, subject to the approval of the Director of the United States Geological Survey, shall enter into cooperative agreements with the U. S. Geological Survey for such engineering and clerical services as may reasonably be necessary for the administration of the Compact. Said agreements shall provide that the Geological Survey shall:
  - 1. Maintain and operate gaging stations at or near the points of measurement specified in Article V (A) of the Compact.
  - 2. Assemble factual information on stream flow, diversion and reservoir storage for the preparation of an annual report to the Governors of the signatory states.
  - 3. Make such investigations and reports as may be requested by the Commission in aid of its administration of the Compact.
- B. Act as Secretary to the Commission.

Article IV. Budget

- A. At the annual meeting of each even numbered year or prior thereto, the Commission shall adopt a budget for operation during the ensuing biennium beginning July first. Such budget shall set forth the total cost of construction, maintenance and operation of gaging stations, the cost of engineering and clerical aid, and other necessary expenses excepting the salaries and personal expenses of the Commissioners. On odd-numbered years revisions of the budget shall be considered.
- B. It shall be the obligation of the Commissioners of the States of Montana and Wyoming to endeavor to secure from the Legislature of their respective states sufficient funds with which to meet the obligations of this Compact, except insofar as provided by the federal government.

Article V. Meetings

An annual meeting of the Commission shall be held on the third Tuesday of each November at some mutually agreeable point in the Yellowstone River Basin for consideration of the annual report for the water year ending the preceding September 30th, and for the transaction

of such other business consistent with its authority; provided that by unanimous consent of the Commission the date and place of the annual meeting may be changed. Other meetings as may be deemed necessary shall be held at a time and place set by mutual agreement, for the transaction of any business consistent with its authority.

No action of the Commission shall be effective until approval by the Commissioners for the States of Wyoming and Montana.

Article VI. Amendments, Revisions and Abrogations.

The Rules and Regulations of the Commission may be amended or revised by a unanimous vote at any meeting of the Commission.

  
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Alex D. McDermott  
Commissioner for Montana

  
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Floyd A. Bishop  
Commissioner for Wyoming

ATTESTED:

  
\_\_\_\_\_  
Frank Stermitz  
Federal Representative

Adopted November 17, 1953  
Amended November 16, 1959

MONTHLY SUMMARY OF DISCHARGE  
Clarks Fork Yellowstone River at Edgar, Montana

Location.--Lat. 45°28'00", long. 108°50'30", in SE1/4, SE1/4, sec.23,T.4 S., R.23 E., on right bank just downstream from highway bridge, half a mile east of Edgar and 6 miles upstream from Rock Creek.

Drainage area.--2,032 sq mi.

Records available.--July, 1921 to September, 1965. Monthly discharge only for some periods, published in WSP 1309. Records since January, 1950 available in annual reports of Yellowstone River Compact Commission.

Gage.--Water-stage recorder. Altitude of gage is 3,440 ft (by barometer). Prior to Sept. 18, 1940, chain gage and Sept. 18, 1940 to Aug. 31, 1953 wire-weight gage, at same site and datum.

Average discharge.--44 years, 1,043 cfs (755,100 acre-ft per year).

Extremes.--Maximum discharge during year, 8,510 cfs June 18 (gage height, 7.82 ft); minimum, 90 cfs Mar. 18 (gage height, 0.88 ft).

1921-65: Maximum discharge observed, 10,900 cfs June 2, 1936 (gage height, 8.62 ft); minimum, 36 cfs Apr. 22, 1961.

Remarks.--Records good except those for periods of ice effect, which are poor. Upstream diversions for irrigation of about 41,500 acres, of which 840 acres lie below the station. In addition, about 6,300 acres of land lying above station are irrigated by diversions from the adjoining Rock Creek basin. See next page for data on the flow of Whitehorse Canal and Clarks Fork Yellowstone River near mouth.

<u>Month</u>	<u>Second-foot days</u>	<u>Maximum</u>	<u>Minimum</u>	<u>Mean</u>	<u>Runoff in Acre-feet</u>
October 1964	11,235	446	307	362	22,280
November	15,471	566	380	516	30,690
December	14,180	700	250	457	28,130
January 1965	13,770	520	400	444	27,310
February	11,795	500	360	421	23,400
March	9,868	600	160	318	19,570
April	17,840	951	399	595	35,390
May	47,780	2,930	925	1,541	94,770
June	172,650	8,150	2,980	5,755	342,400
July	106,640	5,300	1,640	3,440	211,500
August	38,491	1,850	726	1,242	76,350
Sept. 1965	<u>24,988</u>	1,260	518	833	<u>49,560</u>
Water year					
1964-65	484,708	8,150	160	1,328	961,400

MONTHLY SUMMARY OF DISCHARGE  
Clarks Fork Yellowstone River at Edgar, Montana

Supplementary Data

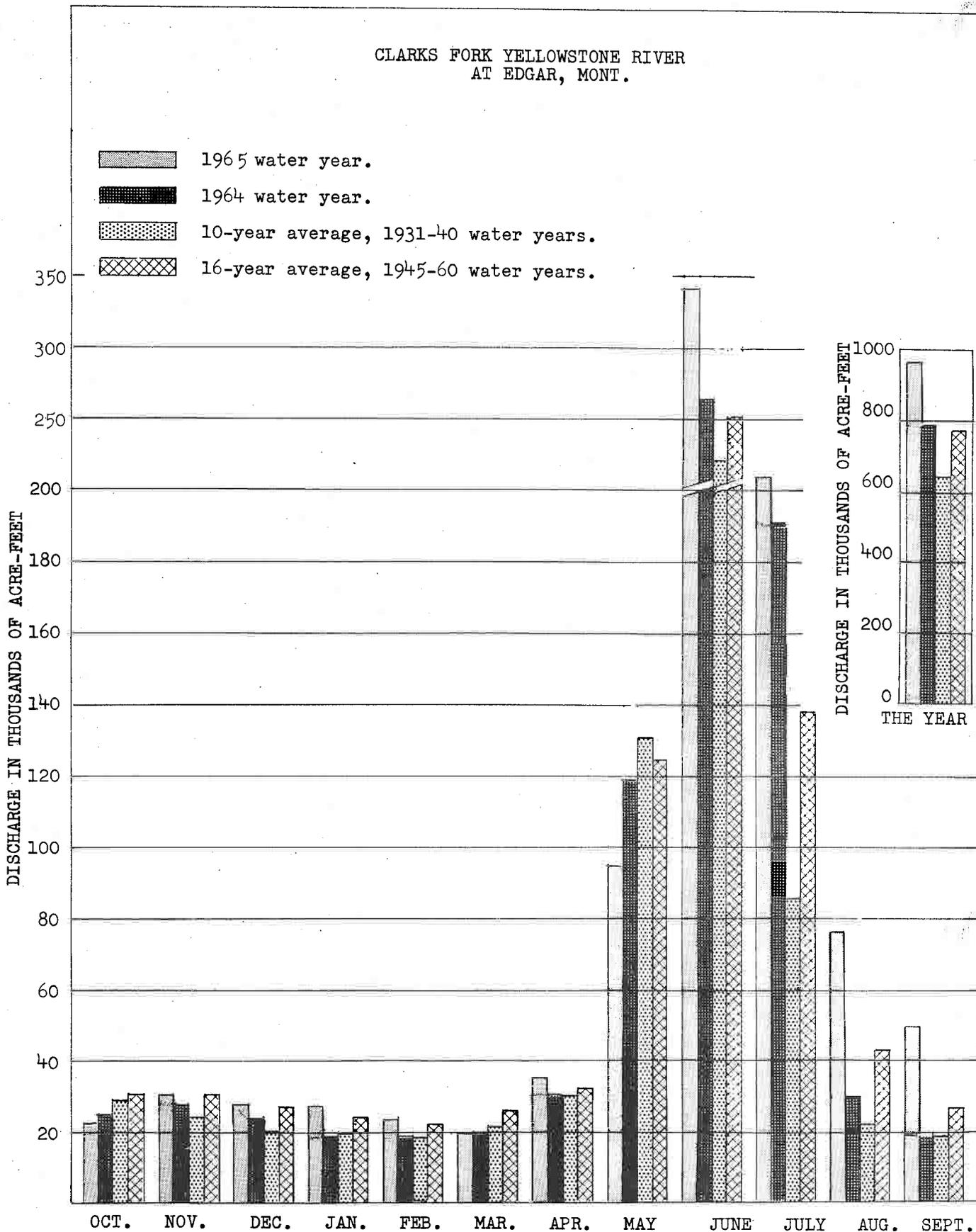
The Compact specified the official point of measurement of the Clarks Fork Yellowstone River shall be just above the mouth of Rock Creek about 6 miles downstream from the gaging station at Edgar. The known intervening diversion is the Whitehorse Canal which begins in SW 1/4, sec. 1, T.4 S., R.23 E., about 4 miles downstream from the gaging station. The canal serves about 1,000 acres. Based upon periodic discharge measurements of the diversion and information on canal operation, that seasonal diversion is estimated at about 12,000 acre-feet.

Periodic discharge measurements of the Clarks Fork Yellowstone River in SE 1/4, sec. 1, T.4 S., R.23 E., about half a mile downstream from the Whitehorse Canal diversion and the Whitehorse Canal are tabulated below. Concurrent discharge shown for the gaging station at Edgar is approximately adjusted for lag time. The indicated inflow may generally be return flow from irrigated lands served by Rock Creek water. The preponderance of loss in the reach points to new diversion that should be identified.

Discharge in cfs at selected points

<u>Date</u>	<u>Clarks Fork at Edgar</u>	<u>Whitehorse Canal</u>	<u>Clarks Fork at SE 1/4, sec.1</u>	<u>Apparent inflow in reach</u>
May 25, 1965	-	29.1	-	-
<u>a/</u> June 7	4,550	50.5	4,950	+450
June 29	5,220	32.8	5,100	- 87
July 22	2,830	53.5	2,750	- 26
August 26	1,450	30.6	1,380	- 39
Sept. 22	1,050	26.0	1,100	+ 76

a/ Some uncertainty as to equivalent discharge at upstream gaging station due to loss of oil from cylinder and large diurnal fluctuation.



Comparison of discharge during 1965 water year with 1964 water year and with average discharge for water years 1931-40 and 1945-60.

MONTHLY SUMMARY OF DISCHARGE  
Little Bighorn River near Hardin, Montana

Location.--Lat 45°44'10", long 107°33'25", in NE1/4 NE1/4, sec.19, T.1 S., R.34 E., on left bank, 50 ft downstream from bridge on Sarpy Road, a quarter of a mile upstream from terminal wasteway of Agency Canal, half a mile upstream from mouth, and 2-1/2 miles east of Hardin.

Drainage area.--1,294 sq mi.

Records available.--June 1953 to September 1965.

Gage.--Water-stage recorder. Altitude of gage is 2,890 ft (from topographic map). Prior to Oct. 7, 1953, wire-weight gage at site 0.4 mile downstream, Oct. 7, 1953 to May 6, 1963, water-stage recorder at site 0.3 mile downstream. May 6, 1963 to Nov. 6, 1963, staff gage at site 0.4 mile downstream. All at different datums.

Average discharge.--12 years, 236 cfs (170,900 acre-ft per year).

Extremes.--Maximum discharge during year, 4,520 cfs Apr. 2; minimum, 21 cfs Nov. 16.

1953-65: Maximum discharge, 4,520 cfs that of April 2, 1965; maximum gage height, 11.78 ft Mar. 20, 1960, site and datum then in use (backwater from ice); minimum discharge observed, 0.2 cfs Aug. 7, 1961, result of discharge measurement.

Remarks.--Records good except those for periods of ice effect or no gage-height record, which are poor. Diversions for irrigation of about 17,000 acres above station. Flow partly regulated by Willow Creek Reservoir (capacity, 23,000 acre-ft). Discharges given include flow of terminal wasteway of Agency Canal.

<u>Month</u>	<u>Second foot days</u>	<u>Maximum</u>	<u>Minimum</u>	<u>Mean</u>	<u>Runoff in Acre-feet</u>
October 1964	5,862	222	166	189	11,630
November	4,490	194	31	150	8,910
December	4,717	250	75	152	9,360
January 1965	6,910	300	145	223	13,710
February	9,691	482	231	346	19,220
March	16,594	702	400	535	32,910
April	22,432	3,850	381	748	44,490
May	20,701	896	381	668	41,060
June	42,340	1,870	1,000	1,411	83,980
July	13,670	982	162	441	27,110
August	4,956	313	100	160	9,830
September 1965	<u>5,800</u>	297	102	193	<u>11,500</u>
Water year 1964- 1965	158,163	3,850	31	433	313,700

## MONTHLY SUMMARY OF DISCHARGE

Bighorn River at Bighorn, Montana

Location.--Lat  $46^{\circ}08'50''$ , long  $107^{\circ}28'00''$ , in NE1/4 NE1/4, sec.33, T.5 N., R.34 E., on right bank half a mile downstream from bridge on Interstate Highway 94, three-quarters of a mile upstream from mouth, 1 mile southwest of Bighorn, and 4 miles east of Custer.

Drainage area.--22,885 sq mi. At site used prior to Oct. 7, 1955, 22,410 sq mi.

Records available.--May 1945 to September 1965. Published as "near Custer," 1945-55. Records since January 1950, available in annual reports of Yellowstone River Compact Commission.

Gage.--Water-stage recorder. Altitude of gage is 2,690 ft (by barometer). May 11 to Dec. 6, 1945, wire-weight gage and Dec. 7, 1945, to Oct. 6, 1955, water-stage recorder, at site 4 miles upstream at different datum.

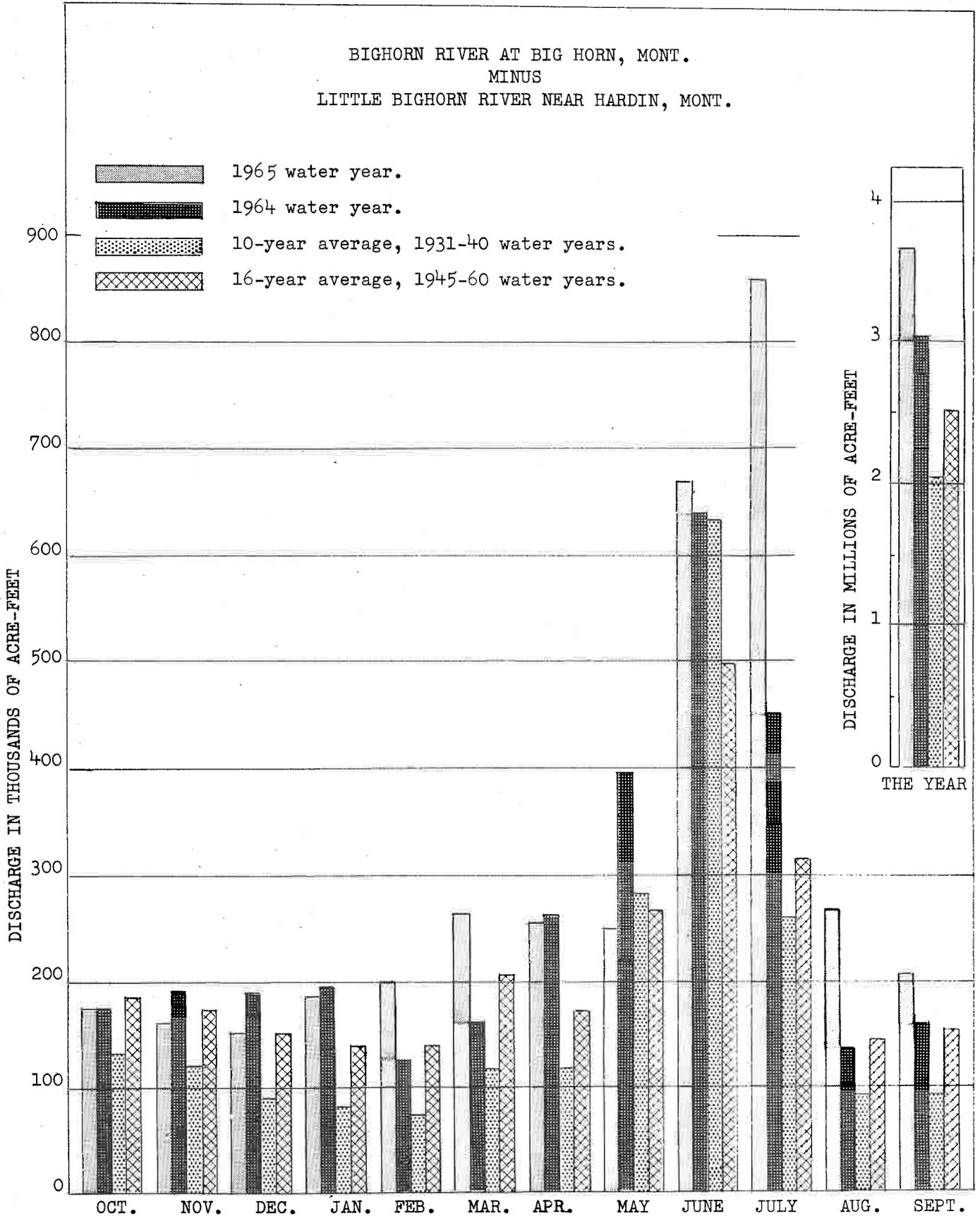
Average discharge.--20 years, 3,763 cfs (2,724,000 acre-ft per year).

Extremes.--Maximum discharge during year, 24,500 cfs June 29 (gage height, 10.41 ft); minimum daily, 1,000 cfs Dec. 20; (minimum gage height, 1.63 ft, Nov. 29).

1945-65: Maximum discharge, 26,200 cfs June 24, 1947 (gage height, 8.79 ft, site and datum then in use), from rating curve extended above 12,500 cfs by logarithmic plotting; maximum gage height recorded, 10.65 ft, Mar. 20, 1947 (ice jam), site and datum then in use; minimum discharge, about 275 cfs Nov. 15, 1959, result of freezeup; minimum daily, 540 cfs July 22, 1960.

Remarks.--Records good except those for periods of ice effect or backwater from Yellowstone River, which are poor. Diversions for irrigation of about 465,000 acres above station. Major regulation by 14 reservoirs in Wyoming and 1 in Montana with combined usable capacity of about 1,400,000 acre-ft (see Appendices C and D).

<u>Month</u>	<u>Second-foot days</u>	<u>Maximum</u>	<u>Minimum</u>	<u>Mean</u>	<u>Runoff in Acre-feet</u>
October 1964	95,160	3,510	2,800	3,070	188,700
November	85,740	3,410	2,000	2,858	170,100
December	80,850	4,000	1,000	2,608	160,400
January 1965	100,900	3,800	2,800	3,255	200,100
February	110,750	6,000	2,750	3,955	219,700
March	149,600	5,400	4,000	4,826	296,700
April	150,510	15,000	3,550	5,017	298,500
May	147,350	6,050	3,470	4,753	292,300
June	380,960	24,100	5,020	12,700	755,600
July	446,810	19,100	7,430	14,410	886,200
August	140,100	8,080	2,800	4,519	277,900
September 1965	<u>110,770</u>	5,320	2,560	3,692	<u>219,700</u>
Water year 1964-1965	1,999,496	24,100	1,000	5,478	3,966,000



Comparison of discharge during 1965 water year with 1964 water year and with average discharge for water years 1931-40 and 1945-60.

MONTHLY SUMMARY OF DISCHARGE  
Tongue River at Miles City, Montana

Location.--Lat 46°21', long 105°48', in SE1/4 sec.23, T.7 N., R.47 E., on right bank 4 miles south of Miles City and 8 miles upstream from mouth.

Drainage area.--5,379 sq mi.

Records available.--April 1938 to April 1942, April 1946 to September 1965. Published as "near Miles City" April 1938 to April 1942. Not equivalent to records published as "near Miles City" May 1929 to September 1932. Monthly discharge only for some periods, published in WSP 1309. Records since January 1950 available in annual report of Yellowstone River Compact Commission.

Gage.--Water-stage recorder. Altitude of gage is 2,370 ft (by barometer). April 1938 to April 1942, wire-weight gage at site 8 miles upstream at different datum. April 1946 to September 30, 1963, at datum 1.00 ft higher.

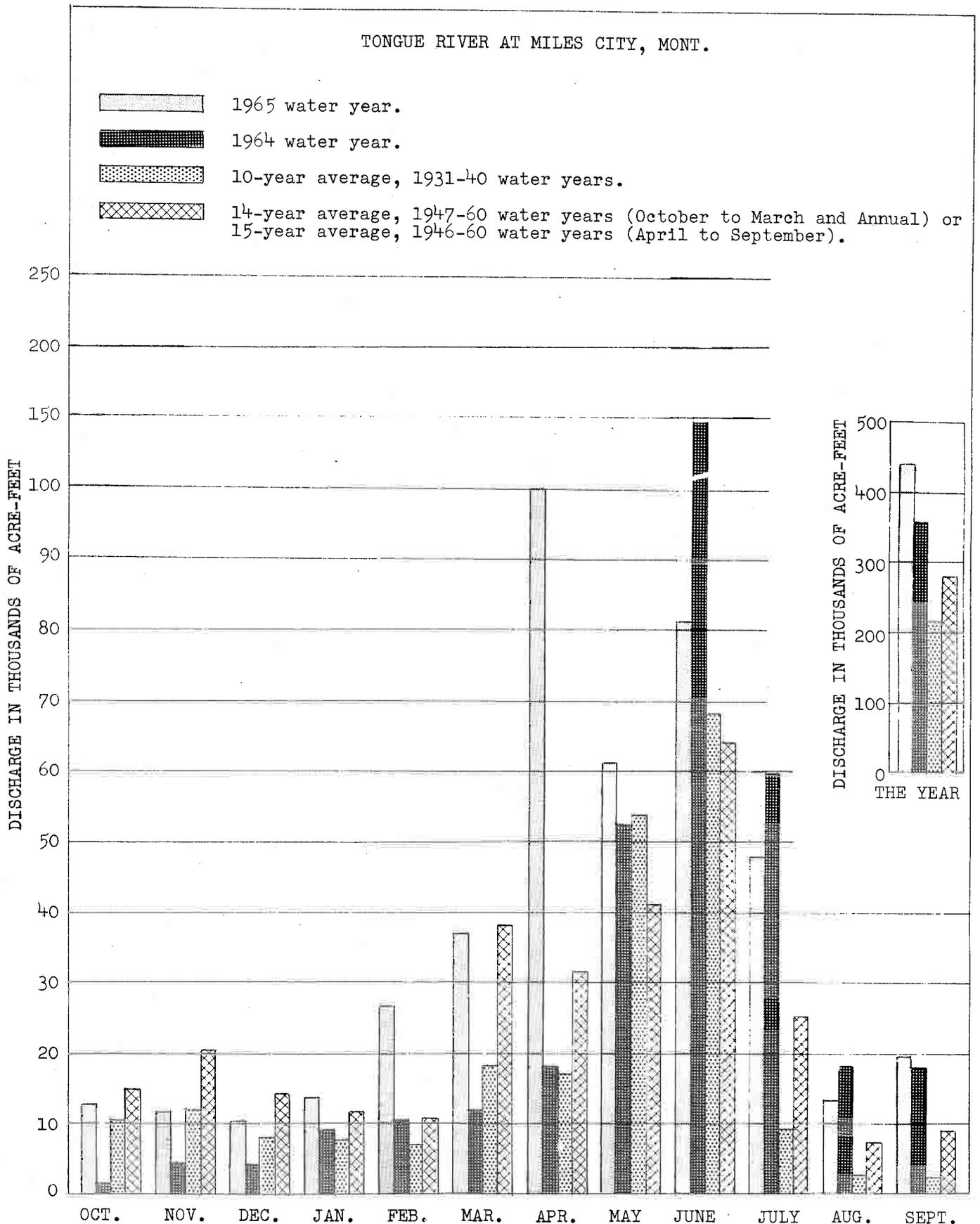
Average discharge.--22 years (1938-41, 1946-65), 377 cfs (272,900 acre-ft per year).

Extremes.--Maximum discharge during year, 10,400 cfs Apr. 4 (gage height, 10.76 ft); minimum daily, 80 cfs Dec. 17.

1938-42, 1946-65: Maximum discharge, 13,300 cfs June 15, 1962 (gage height 12.33 ft, present datum), from rating curve extended above 3,200 cfs on basis of float measurement; maximum gage height, 13.27 ft (present datum) March 19, 1960 (ice jam); no flow July 9-19, Aug. 13,14, Sept. 28. 1940.

Remarks.--Records good except those for periods of ice effect or no gage height record, which are poor. Diversions for irrigation of about 90,000 acres above station. Flow regulated by Tongue River Reservoir (Appendix C) and many small reservoirs (combined capacity, about 15,000 acre-ft).

<u>Month</u>	<u>Second-foot days</u>	<u>Maximum</u>	<u>Minimum</u>	<u>Mean</u>	<u>Runoff in Acre-feet</u>
October 1964	6,448	323	112	208	12,790
November	5,774	339	125	192	11,450
December	5,210	240	80	168	10,330
January 1965	6,860	340	105	221	13,610
February	13,415	800	315	479	26,610
March	18,725	800	450	604	37,140
April	50,780	5,960	668	1,693	100,700
May	30,756	1,310	646	992	61,000
June	40,839	2,210	878	1,361	81,000
July	24,119	1,980	270	778	47,840
August	6,650	363	144	215	13,190
September 1965	<u>9,960</u>	530	247	332	<u>19,760</u>
Water year 1964-1965	219,536	5,960	80	601	435,400



Comparison of discharge during 1965 water year with 1964 water year and with average discharge for water years 1931-40 and 1947-60.

MONTHLY SUMMARY OF DISCHARGE  
Powder River near Locate, Montana

Location.--Lat 46°26', long 105°18', in NE1/4 sec.26, T.8 N., R.51 E., on right bank 50 ft downstream from bridge on U.S. Highway 12 at present site of Locate (5 miles west of former site of Locate), 3 miles upstream from Locate Creek, and 25 miles east of Miles City.

Drainage area.--13,189 sq mi.

Records available.--March 1938 to September 1965. Records since January 1950 available in annual reports of Yellowstone River Compact Commission.

Gage.--Water-stage recorder and wire-weight gage. Altitude of gage is 2,400 ft (by barometer). Prior to July 11, 1947, wire-weight gage at bridge 50 ft upstream and Dec. 12, 1962 to July 13, 1964, water-stage recorder at site 100 ft upstream at same datum.

Average discharge.--27 years, 599 cfs (433,700 acre-ft per year).

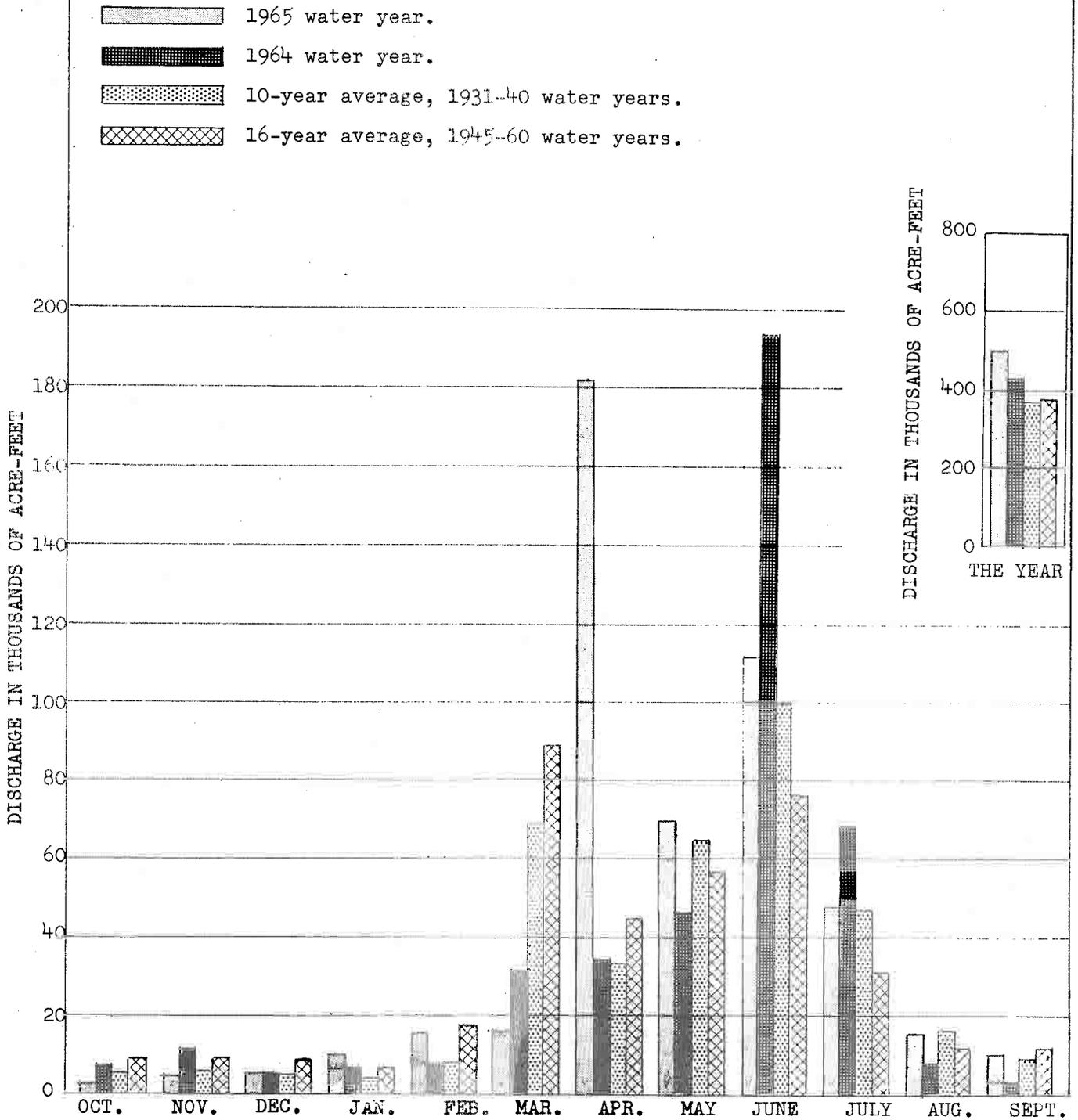
Extremes.--Maximum discharge during year, 29,600 cfs Apr. 3, (gage height, 10.98 ft) daily, 25 cfs Nov. 29.

1938-65: Maximum discharge observed, 31,000 cfs Feb. 19, 1943 (gage height 11.23 ft), from rating curve extended above 17,000 cfs; no flow Jan. 16 to Feb. 12, Feb. 22-24, 1950, July 27, Sept. 21-27, Oct. 1, 1960, Sept. 4-8, 1961.

Remarks.--Records fair April 3 to July 21, remainder are poor. Diversions for irrigation of about 52,000 acres above station. Some regulation by tributary reservoirs with combined usable capacity of 36,800 acre-ft.

<u>Month</u>	<u>Second-foot days</u>	<u>Maximum</u>	<u>Minimum</u>	<u>Mean</u>	<u>Runoff in Acre-feet</u>
October 1964	1,301	70	30	42.0	2,580
November	2,299	130	25	76.6	4,560
December	2,900	130	40	93.5	5,750
January 1965	5,205	260	125	168	10,320
February	7,940	600	200	284	15,750
March	8,330	440	100	269	16,520
April	91,875	23,300	600	3,062	182,200
May	35,382	2,100	596	1,141	70,180
June	56,880	5,580	1,040	1,896	112,800
July	24,092	1,790	174	777	47,790
August	8,130	865	100	262	16,130
September 1965	<u>5,191</u>	300	117	173	<u>10,300</u>
Water year					
1964-1965	249,525	23,300	25	684	494,900

POWDER RIVER NEAR LOCATE, MONT.



Comparison of discharge for 1965 water year with 1964 water year and with average discharge for water years 1931-40 and 1945-60.

## RESERVOIRS COMPLETED AFTER JANUARY 1, 1950

## BOYSEN RESERVOIR

Water-stage recorder at dam on Wind River, about 21 miles south of Thermopolis, Wyoming. Reservoir formed by earth-fill dam, construction of which began in 1947. Storage began October 11, 1951. Dead storage, 62,000 acre-feet at elevation 4,657.0. Usable contents, 758,000 acre-feet at elevation 4,725.0 (top of gates). Crest of dam at elevation, 4,758.

Records given herein represent usable contents. Water is used for irrigation and power development. Allocation for flood control provided. Data furnished by U. S. Bureau of Reclamation.

Extremes.--Maximum usable contents during year, 803,600 acre-feet June 28 (elevation, 4,727.28 ft); minimum, 416,800 acre-feet May 14 (elevation 4,704.44).

1953-64: Maximum usable contents, 857,400 acre-feet, July 5, 1957 (elevation, 4,729.85 ft); minimum, 189,800 acre-ft March 18, 19, 1956 (elevation, 4,684.18 ft).

<u>Month</u>	<u>Water-surface elevation in feet</u>	<u>*Contents in Acre-feet</u>	<u>Change in contents during month in acre-feet</u>
September 30, 1964	4,718.88	643,700	
October 31	4,718.23	632,300	-11,400
November 30	4,716.60	604,200	-28,100
December 31	4,713.86	558,800	-45,400
January 31, 1965	4,711.71	524,500	-34,300
February 28	4,709.76	494,400	-30,100
March 31	4,706.02	439,200	-55,200
April 30	4,704.79	421,700	-17,500
May 31	4,706.07	439,900	+18,200
June 30	4,727.00	797,800	+357,900
July 31	4,725.00	757,800	-40,000
August 31	4,723.97	737,700	-20,100
September 30, 1965	4,724.25	743,100	+5,400
Water year 1964-65			+99,400

\*Does not include dead storage of 62,000 acre-feet.

## RESERVOIRS COMPLETED AFTER JANUARY 1, 1950

## ANCHOR RESERVOIR

Water-stage recorder at dam on South Fork Owl Creek, 31 miles west of Thermopolis, Wyoming. Reservoir formed by thin concrete arch dam, construction of which began in 1957. Closure of dam made November 21, 1960. Temporary outlet at elevation 6,304.30 ft still in use. Lowest permanent outlet sill at elevation 6,343.75 ft, total contents, 148 acre-feet. Total contents, 17,420 acre-feet at upper active capacity level of 6,441 ft. Crest of dam at elevation 6,452.5 ft.

Changes in reservoir content reflect fluctuations during continued sealing operation. Data furnished by U. S. Bureau of Reclamation.

<u>Month</u>	<u>Water-surface elevation in feet</u>	<u>*Contents in Acre-feet</u>	<u>Change in contents during month in acre-feet</u>
September 30, 1964	6,304.30	0	
October 31	6,304.30	0	0
November 30	6,304.30	0	0
December 31, 1964	6,304.30	0	0
January 31, 1965	6,304.30	0	0
February 28	6,304.30	0	0
March 31	6,304.30	0	0
April 30	6,304.30	0	0
May 31	6,304.30	0	0
June 30	6,393.21	3,669	+3,669
July 31	6,368.18	977	-2,692
August 31	6,345.20	168	-809
September 30, 1965	6,304.30	0	-168
Water year 1964-65			0

\*Includes dead storage.

## RESERVOIRS IN EXISTENCE ON JANUARY 1, 1950

The extent, if any, of the use of reservoirs in this category which may be subject to Compact allocations was not determined. As a matter of hydrologic interest, the month-end contents in acre-feet of four reservoirs are given. The first three reservoirs are in the Bighorn River Basin in Wyoming and data on contents were furnished by the U. S. Bureau of Reclamation. Tongue River Reservoir in Montana is operated under the supervision of the Montana State Water Conservation Board, which agency furnished operating data.

## Contents in Acre-feet

<u>Month</u>	<u>Bull Lake</u>	<u>Pilot Butte Reservoir</u>	<u>a/ Buffalo Bill Reservoir</u>	<u>b/ Tongue River Reservoir</u>
September 30, 1964	94,800	4,800	277,300	30,000
October 31	88,600	0	232,600	25,200
November 30	89,100	6,200	226,800	25,100
December 31, 1964	91,100	10,400	227,600	c/ 29,000
January 31, 1965	89,400	11,700	222,600	c/ 31,000
February 28	85,600	14,100	191,700	c/ 35,000
March 31	76,900	24,100	159,100	c/ 50,000
April 30	44,500	30,800	165,500	c/ 20,000
May 31	44,400	26,700	232,900	26,900
June 30	120,500	28,100	441,700	c/ 65,000
July 31	151,600	17,200	430,100	58,500
August 31	150,200	19,800	400,500	46,500
September 30, 1965	134,400	17,200	384,400	38,000
Change in Contents during year	+39,600	+12,400	+107,100	+8,000

a/ Revised capacity table based on survey of 1959; contents prior to October 1960 based on survey of 1941.

b/ Contents based upon sedimentation surveys of October 1948.

c/ Contents estimated on basis of irregular readings of reservoir stage and discharge records above and below the reservoir.